

WHAT IS CLAIMED IS

1. A method for dynamic bandwidth allocation (DBA) in a passive optical network that includes a plurality of optical network units (ONUs) coupled to an optical line terminal (OLT), the method comprising the steps of: by the OLT, in each given cycle:

a) calibrating requests issued by each of the ONUs to obtain respective calibrated requests;

b) allocating a bandwidth amount to each ONU based on said calibrated requests using an allocation scheme selected from the group consisting of an under-utilization allocation scheme and an over-utilization allocation scheme; and

c) based on said bandwidth allocation, granting the ONUs a second plurality of constant delay grants per each said cycle;

whereby said granting facilitates a tight jitter/delay guarantee and high fairness and eliminates grant loss.

2. The method of claim 1, wherein in each said cycle, each said ONU issues a report to said OLT, and wherein said step of calibrating requests includes limiting said requests by an available credit.

3. The method of claim 2, wherein said limiting of said requests by an available credit is preceded by the following: for each said ONU:

i. reading a requested amount of bytes that represent a current report value of said report;

ii. estimating a queue occupancy by updating said report value based on grants issued by the OLT in an immediately preceding cycle;

iii. by the OLT, using said available credit to account for said updated report value; and

iv. adjusting each said request to achieve a guaranteed service level.

4. The method of claim 1, wherein said step of allocating bandwidth using an under-

utilization allocation scheme includes assigning a grant based on a respective ONU request and on service level agreement (SLA) parameters based on a respective ONU importance.

5. The method of claim 1, wherein said step of allocating bandwidth using an over-utilization allocation scheme includes calibrating all said ONUs to provide a grant size that will fairly satisfy all service level agreements (SLAs) of all said ONUs, thereby providing high uplink utilization.

7. The method of claim 4, wherein said assigning a grant based on a respective importance factor includes adding an additional amount of bytes to a requested amount of bytes, said additional amount correlated with an ONU importance.

8. The method of claim 6, wherein said assigning a grant based on a respective importance factor further includes:

- a) running a first loop from a lowest to a highest said importance factor, to provide an input variable;
- b) using said input variable, running a second loop over all said ONUs, starting with said highest importance ONU, to provide an indication if a grant can be increased; and
- c) if a respective ONU grant can be increased, increasing said respective ONU grant with a configurable byte amount.

9. In an Ethernet passive optical network (EPON), a method for dynamically allocating bandwidth to a plurality of optical network units (ONUs) that are granted grants by an optical line terminal (OLT) in response to requests, the method comprising the steps of:

- a) per each grant cycle, responsive to the requests of each ONU, determining an uplink utilization state that includes a state selected from the group of under-utilization and over-utilization; and
- b) running independently a bandwidth allocation scheme correlated with said

uplink utilization state, said bandwidth allocation scheme selected from the group of respectively an under-utilization allocation scheme and an over-utilization allocation scheme.

10. The method of claim 8, wherein said step of determining an uplink utilization includes comparing a sum of all said requests with a size of said cycle, whereby said under-utilization occurs when said sum of all requests is smaller than said cycle size.
11. The method of claim 9, wherein in a case of said under-utilization each of said ONUs is associated with an importance parameter, and wherein said step of running an under-utilization scheme includes handling said ONUs based on each said ONU respective importance.
12. The method of claim 10, wherein said handling of said ONUs based on their respective importance further includes determining a grant size per each said cycle by adding a given amount of bytes to each said ONU, said addition of bytes based on said respective importance.
13. The method of claim 11, wherein said determining a grant size per each said cycle by adding a given amount of bytes to each said ONU base on said respective importance further includes:
 - a) running a first loop from a lowest to a highest said importance factor, to provide an input variable;
 - b) using said input variable, running a second loop over all said ONUs, starting with a highest importance ONU, to provide an indication if a grant can be increased, and;
 - c) if a respective ONU grant can be increased, increasing said respective ONU grant with a configurable byte amount.
14. The method of claim 10, further said step of running an under-utilization scheme

further includes stopping said handling after a cycle in which a said grant equals said cycle size.

15. In an Ethernet passive optical network (EPON) that includes a plurality of optical network units (ONUs) interacting with an optical line terminal (OLT), a method for dynamically allocating bandwidth by the OLT to the ONUs in an under-utilization state of a cycle, comprising the steps of:
 - a) determining the importance of each ONU; and
 - b) allocating bandwidth based on said importance.